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(54) Title
PLASTIC LAYER DEVICE BETWEEN TWO GLASS PANES

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(56) Prior Art Documents
AU 68105/87 B32B 17/10
AU 55040/86 B32B 17/10
GB 2015427

(57) Claim

1. A method of producing a layer of plastics material between two glass panes, wherein the plastics material is fed in liquid form between the two glass panes being maintained parallel and sealed at the outer edges thereof, and a pressure is exerted on the outer surfaces of the glass panes by means of pressure application devices movable over the outer surfaces of the glass panes, wherein one or a plurality of parallel pressure devices starting from one end of the glass panes are moved to the other end of the glass panes relative thereto at a velocity related to the curing rate of the plastics material, said devices being guided in the area of the liquid surface of the plastics material so as either to press one glass pane against the other glass pane with the plastics material therebetween said panes standing vertically or in an inclined position and arranged at or upon a solid support, or to press the two glass panes against each other with the plastics material therebetween.

2. The method according to claim 1, wherein the plastics material is quickly cured by an intense external radiation.

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INTERNATIONALE ANMELDUNG VERÖFFENTLICHT NACH DEM VERTRAG ÜBER DIE
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(71) SECTION 34(4)(a) DIRECTION SEE FOLIO 13 NAME DIRECTED VCB S.A. (71) Avenue Louise 326 Bte 7 B-1050 Bruxelles Belgium BAU HAHN GMBH + CO. KG [DE/DE]: Hanauer Landstr. 211, D-6000 Frankfurt 1 (DE).		<div style="border: 1px solid black; padding: 5px; display: inline-block;"> AUSTRALIAN 15 JUL 1987 PATENT OFFICE </div> <div style="border: 1px solid black; border-radius: 50%; padding: 10px; display: inline-block; text-align: center;"> AUG 1987 AUSTRALIAN Sec 34(4) PATENT </div>	
(72) Erfinder; und (75) Erfinder/Anmelder (nur für US): HAHN, Thomas [DE/DE]: Hanauer Landstr. 211, D-6000 Frankfurt/Main 1 (DE).			

(54) Title: PROCESS AND DEVICE FOR PRODUCING A PLASTIC LAYER BETWEEN TWO GLASS PANES

(54) Bezeichnung: VERFAHREN ZUR HERSTELLUNG EINER KUNSTSTOFFSCHICHT ZWISCHEN ZWEI GLASSCHEIBEN UND VORRICHTUNG ZUR DURCHFÜHRUNG DES VERFAHRENS

(57) Abstract

A process and device for producing a plastic layer between two glass planes whereby liquid plastic is introduced between two inclined or vertical glass panes, the external edges of which are kept parallel and sealed. Both panes are pressed together by one or several parallel rotating pressing means which engage their outer surface and preferably extend over their whole width. The pressing means can be moved from one end to the other end of the glass panes, over their entire length, at the curing speed of the plastic.

(57) Zusammenfassung

Ein Verfahren zur Herstellung einer Kunststoffschicht zwischen zwei Glasscheiben und eine Vorrichtung zur Durchführung dieses Verfahrens, wobei zwischen die beiden schräg oder senkrecht gestellten, an ihrem äusseren Rand parallel gehaltenen und abgedichteten Glasscheiben der Kunststoff in flüssiger Form eingefüllt wird, zeichnen sich dadurch aus, dass die beiden Glasscheiben jeweils an ihrer Aussenfläche durch eine oder mehrere von parallel geführten, vorzugsweise über die gesamte Glasscheibenbreite reichenden, drehbaren Andruckvorrichtungen gegeneinander gepresst werden, die über die gesamte Länge der Glasscheiben bewegbar sind und dass beginnend am einen Ende der Glasscheiben die Andruckvorrichtungen zum anderen Ende der Glasscheiben relativ zu diesen mit der Aushärtageschwindigkeit des Kunststoffes bewegt werden.

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whole space between the glass panes until an opening provided in the spacer for the ventilation is closed. The recession or reformation of the bulge of the glass pane may also be effected additionally by means of a suction cup connected by a hose to a subpressure source.

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Furthermore, from DE-OS 27 28 762 a method is known of producing a laminated glass pane, wherein the space between two horizontal panes maintained parallel to each other by a spacer is filled with a plastics material. Measures to avoid the tendency of the glass panes
10 to bulge outwards and inwards, respectively, which is caused by the pressure of the plastics material filled in and by the weight of the upper glass pane, are not considered in said publication.

Another method of producing laminated glass panes is specified in DE-
15 OS 26 06 569. According to said method, the plastics material is filled into the interspace between the two glass panes in the inclined position and the curing proper takes place in the horizontal position.

20 Further, from DE-PS 27 37 740 a method is known of producing a laminated glass ^{consisting} ~~consisting~~ of two glass panes and one intermediate layer wherein an already finished layer of plastics material is glued as intermediate layer between the glass panes, and the glass panes are pressed against the layer of plastics material by means of ro-
25 tatable rollers in order to avoid gas bubbles in the adhesive lamina. This method of bonding glass plates and intermediate layer is, however, expensive and requires, moreover, a pre-fabricated layer of



In the method according to the invention filling process and curing process are combined whereby a large number of technical problems are overcome as they occur e.g. when the glass panes are brought in the vertical position to render possible a good inflow of the plastics material and to avoid inclusions of air bubbles. With the filling and curing process according to the invention a high static pressure which would destroy the necessarily soft sealing of the edges and would cause a tendency of outward bulging of the glass panes is not built-up even when the panes are set up vertically. The production of glass panes of a uniform thickness and very large dimensions is guaranteed. It is no problem to separate the finished sheet of plastics material from the glass panes when a plastics material is used which does not react with glass or when the inner surfaces of the glass panes are provided with separating agents before the filling process is started. In particular the method according to the invention gives the possibility of the combined production of very long laminas of plastics material. In particular, it is possible to produce laminated glass panes by the method according to the invention in a simple way and of high quality. Laminas of plastics material may be obtained up to any arbitrary filling level which are ^{faultless} ~~blameless~~ and free of air bubbles.

Due to the quick curing of the plastics material it is possible that the devices to achieve a pressure (pressure devices) keep the glass panes separated at an exact distance during the filling process, that a quick polymerisation of the plastics material is initiated, and that the plastics material now solidifying has no flow properties



violet radiation, the curing rate may be determined quite exactly. In order to consider production errors due to aging processes of the radiation source, its intensity can be regulated.

5 A further development of the invention is that one or more radiation sources are located before or behind one of the two devices to achieve pressure and are movable together with them. Depending on the sensitivity of the material to be radiated and its thickness the curing rate can be determined by switching on a plurality of light
10 sources respectively arranged between said devices.

A further development of the invention is that the plastics material is fed in in conformity with the rate of motion of the pressure devices which are respectively guided in the area of the liquid surface
15 of the plastics material. This allows that only the rate of inflow of the plastics material must be controlled when the rate of the pressure devices and light sources is constant.

A further development of the invention is that the plastics material
20 is filled in and the devices to achieve pressure are moved such that said devices are always in the area of the liquid surface of the plastics material. A constant filling rate is assumed therefor and the rate of the pressure devices and of the radiation path is adapted to the liquid surface of the plastics material. For example, when the
25 liquid is supplied uniformly, the filling rate is halved when the interspace between the glass panes has been doubled.



after the other one through the positioning station and, e.g. through the radiation station.

The devices to achieve pressure must not fulfill specific requirements. Besides drums and rollers hoses filled with liquid may be used which have a more gentle effect on the surface. In order to prevent the glass surfaces from being scratched, it is also possible to provide a protective sheet or film between pressure devices and glass panes.

10

The devices to achieve pressure may be provided alternatively also with pneumatic, hydraulic or mechanic (with spring action) control devices which effect an exact pressure compensation over the total surface of the glass pane when the pressure devices are moved.

15 It is also possible to move air-cushion developing aggregates relative to the glass panes whereby their surfaces are in no way damaged due to the non-contact pressure effect.

A further development of the invention is that it is also possible to process besides one-component plastics materials multi-component materials. When surplus of plastics material (fat edges) occurs in the interspace between the glass panes when the plastics material is filled in, it is possible to convey the liquid to be filled in by means of a thin hose, for instance a sausage skin, into the interspace between the glass panes until up to the upper liquid level and to heave it (the hose) continuously up and outwards with the liquid level. The ratio of processing time to curing time in the presently



A further development of the invention is that the temperature of the glass pane and of the liquid plastics material to be filled in is different. When, for example, the plastics material to be filled in is heated, a precipitate is formed immediately at the upper edge of the liquid column on the surface of the glass which counteracts the adhesion of plastics material to the glass.

The invention will be explained ^{by way of example} hereinafter by means of the drawings, wherein

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Fig. 1 illustrates an embodiment of the apparatus according to the invention,

Fig. 2 illustrates another embodiment of the apparatus according to the invention, and

15 Fig. 3 illustrates an embodiment of the apparatus according to the invention wherein a plurality of drums and radiation sources are provided.

Fig. 1 shows a vertically positioned pane unit comprising two glass panes 1, 1 and a spacing ^{piece} ~~piece~~ or a spacer 2 which are held in position by pressure devices in the form of drums or rollers 4 running before and behind (said panes) when liquid plastics material 3 is fed in the interspace 5 between said panes. Especially with a vertical arrangement it is possible to produce pane units of more than two
25 panes 1 at the same time, by filling the interspaces between the glass panes simultaneously with liquid plastics material 3 which requires special attention for example when the distances between the



Contrary to the embodiments according to Figs. 1 and 2 the latter embodiment does not require a device for moving the devices to achieve pressure. Instead a moving device for moving the glass pane unit must be provided. As both moving means may be implemented in any way desired, it was renounced to illustrate them.

The embodiments were explained in connection with the use of drums as devices to achieve pressure. Meanwhile, however, rotatably mounted rollers turned out to be good in practice. However, also a number of other pressure devices such as those referred to at the beginning are imaginable without cutting down the advantageous effect of the apparatus according to the invention.



serially arranged are produced for forming a multiple laminated glass pane.

10. The method according to one of the preceding claims, wherein after having produced one or a plurality of layers of plastics material between two and more glass panes one or a plurality of further layers of plastics material are added to an original laminate of glass panes and of multiple laminated glass panes, respectively.

11. An apparatus when used to perform the method according to one of the claims 1 to 10, wherein one or a plurality of pressure devices guided in parallel are provided which are provided either above one of the glass panes and press it against the other one standing vertically or in an inclined position and arranged at or upon a solid support, or are provided on the surfaces of the two glass panes and press the glass panes against each other, and that a device is provided for movement of said pressure devices relative to the glass panes or vice versa.

12. The apparatus according to claim 11, wherein the pressure devices extend over the total width of the glass pane.

13. The apparatus according to claims 11 or 12, wherein one or a plurality of radiation sources are located between two or a plurality of pressure devices.

14. The apparatus according to claims 11 or 12, wherein a heating source is provided in the pressure devices.

15. The apparatus according to one of the preceding claims, wherein the pressure devices are rotatably mounted drums, rollers or flexible hoses filled with liquid, the pressure effect of which is controllable selectively hydraulically, pneumatically or mechanically, or that the pressure devices comprise aggregates developing air cushions.

16. A method of producing a layer of plastics material between two panes substantially as hereinbefore described with reference to the accompanying drawings.

17. An apparatus as claimed in any one of claims 11 to 15 substantially as hereinbefore described with reference to the accompanying drawings.

DATED this TENTH day of JULY 1989

Glasbau Hahn GmbH & Co KG

Patent Attorneys for the Applicant
SPRUSON & FERGUSON



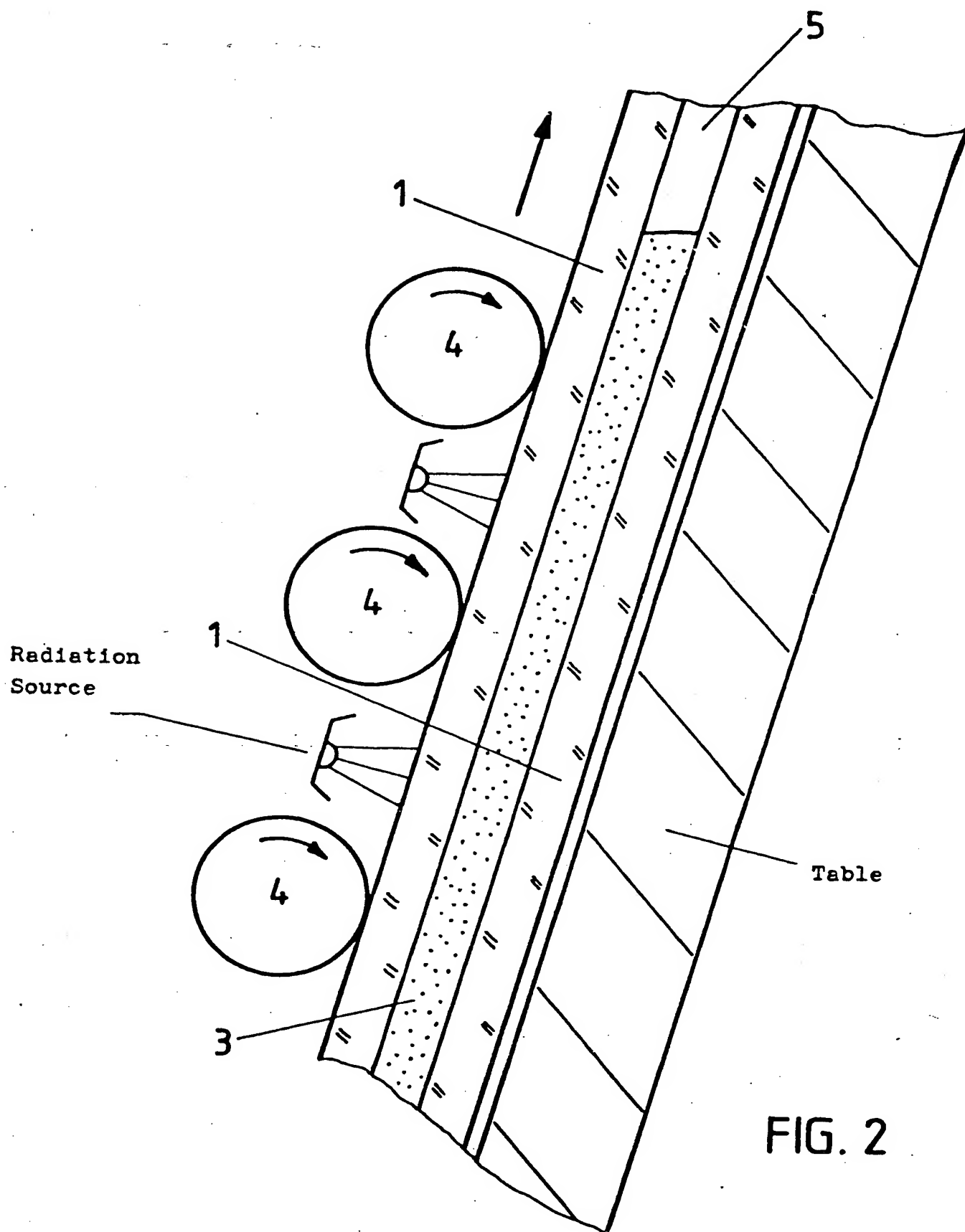


FIG. 2

INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP86/00769

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) *		
According to International Patent Classification (IPC) or to both National Classification and IPC		
Int.Cl ⁴ : B 32 B 17/10; C 03 C 27/12; B 29 C 35/08; E 29 C 43/34; B 29 C 43/20		
II. FIELDS SEARCHED		
Minimum Documentation Searched *		
Classification System	Classification Symbols	
Int Cl ⁴ B 32 B; C 03 C		
Documentation Searched other than Minimum Documentation to the extent that such Documents are Included in the Fields Searched *		
III. DOCUMENTS CONSIDERED TO BE RELEVANT *		
Category *	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
X	GB, A, 2015427 (PILKINGTON BROTHERS) 12 September 1979, see page 1, lines 3-14, 44-89, 97-109; page 2, lines 5-17 and line 105 - page 3, line 24 and 38-107; page 4, lines 15-51; claims 1-12, 16, 17, 21-29; figure 1	1-6, 8, 9, 11, 13-15
A	FR, A, 2161443 (SAINT-GOBAIN) 06 July 1973, see page 4; example 2	1
A	EP, A, 0085602 (SAINT GOBAIN VITRAGE) 10 August 1983, see page 6, lines 10-36; figure 3	1-3, 6, 7
<p>* Special categories of cited documents: ¹⁰</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&" document member of the same patent family</p>		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search		Date of Mailing of this International Search Report
23 March 1987 (23.03.87)		16 April 1987 (16.04.87)
International Searching Authority		Signature of Authorized Officer
European Patent Office		

INTERNATIONALER RECHERCHENBERICHT

Internationales Aktenzeichen **PCT/EP 86/00769**

I. KLASSEIFIKATION DES ANMELDUNGSGEGENSTANDS (bei mehreren Klassifikationssymbolen sind alle anzugeben) ⁶		
Nach der Internationalen Patentklassifikation (IPC) oder nach der nationalen Klassifikation und der IPC		
Int. Cl. 4	B 32 B 17/10; C 03 C 27/12; B 29 C 35/08; B 29 C 43/34; B 29 C 43/20	
II. RECHERCHIERTE SACHGEBIETE		
Recherchierter Mindestprüfstoff ⁷		
Klassifikationssystem	Klassifikationssymbole	
Int. Cl. 4	B 32 B; C 03 C	
Recherchierte nicht zum Mindestprüfstoff gehörende Veröffentlichungen, soweit diese unter die recherchierten Sachgebiete fallen ⁸		
III. EINSCHLÄGIGE VERÖFFENTLICHUNGEN⁹		
Art*	Kennzeichnung der Veröffentlichung ¹¹ soweit erforderlich unter Angabe der maßgeblichen Teile ¹²	Betr. Ansprüch Nr. ¹³
X	GB, A, 2015427 (PILKINGTON BROTHERS) 12. September 1979, siehe Seite 1, Zeilen 3-14, 44-89, 97-109; Seite 2, Zeilen 5-17 und Zeile 105 - Seite 3, Zeile 24 und 38-107; Seite 4, Zeilen 15-51; Patentansprüche 1-12, 16, 17, 21-29; Figur 1 --	1-6, 8, 9, 11, 13-15
A	FR, A, 2161443 (SAINT-GOBAIN) 6. Juli 1973 siehe Seite 4; Beispiel 2 --	1
A	EP, A, 0085602 (SAINT GOBAIN VITRAGE) 10. August 1983, siehe Seite 6, Zeilen 10-36; Figur 3 -----	1-3, 6, 7
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IV. BESCHEINIGUNG		
Datum des Abschlusses der internationalen Recherche		Absendedatum des internationalen Recherchenberichts
23. März 1987		16 APR 1987
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